

*Island of the Blue Dolphins*, Chapter 23  
**Interpreting Sea Otter Diet Data**

**Grade Level**

Upper Elementary: Third Grade through Fifth Grade

**Subject**

Mathematics, Science

**Common Core Standards**

MP.4, RI.4.7, W.4.2.c, W.4.7

**Next Generation Science Standards**

3-LS4-3

**Background Information**

After Karana stumbles on an injured baby sea otter, she takes up the responsibility of feeding the pup. She brings the sea otter live fish because she knows that sea otters will not eat anything that is dead. Throughout the chapter, Karana spears fish for the sea otter. She does not provide the pup with any other food options.

What is the typical sea otter diet on San Nicolas Island? Scientists often interpret research data collected by other scientists. This activity asks students to interpret data presented in a graph, and then draw conclusions about the diet of sea otters on San Nicolas Island.

**Materials**

- Copy of activity sheet for each student (provided)
- Crayons or colored pencils
- Class set of *Island of the Blue Dolphins*

**Procedure**

1. Give each student a copy of the student activity sheet.
2. Help students understand the graph printed on the activity sheet, explaining how it illustrates that the diet of sea otters around San Nicolas Island suggests they have certain foods they prefer. You may wish to review with students the caption that accompanies the published version of the graph: “Relative proportions of five common prey types in the diets of sea otters at San Nicolas Island by month. Numbers on x-axis refer to months (January–December 2003). Data presented are limited to months in which >100 dives were recorded.”
3. Give students time to complete the activity sheet; monitor their work. Then bring the class together for a discussion about the answers.
4. To shorten this activity: Interpret the graph as a whole-class activity.
5. To lengthen this activity: Divide students into groups and assign each group a food source: red urchins, kelp crabs, or purple urchins. Have each group create a

written description of what happens to the sea otter preference for their food type throughout the year. Ask students to try to explain why this variation occurs, conducting additional research to arrive at their conclusion.

**Note:** The graph on the activity sheet is adapted from figure 7 of Gena B. Bentall's University of California, Santa Cruz master's thesis (2005) on sea otter behavior. It is used with permission. Bentall's complete thesis is available here: [https://werc.ucsc.edu/Bio%20and%20tech/Bentall/Bentall\\_thesis.pdf](https://werc.ucsc.edu/Bio%20and%20tech/Bentall/Bentall_thesis.pdf). A shorter version is published as: M. Tim Tinker, Gena Bentall, and James A. Estes, "Food Limitation Leads to Behavioral Diversification and Dietary Specialization in Sea Otters," *PNAS* 105, no. 2 (2008): 560–65.

### **Enrichment Activities**

Think about how food preferences get passed down from human parents to their offspring. Have students identify particular food preferences within their families. Do students like some of the same foods as their parents or grandparents? Why might that be?

### **Teachers' Note**

The y-axis displays **relative frequency**. A frequency count is a measure of the number of times that an event takes place. Here relative frequency is a frequency count for one food type compared to the frequency count for all food types.

The equation for relative frequency for a subgroup is:

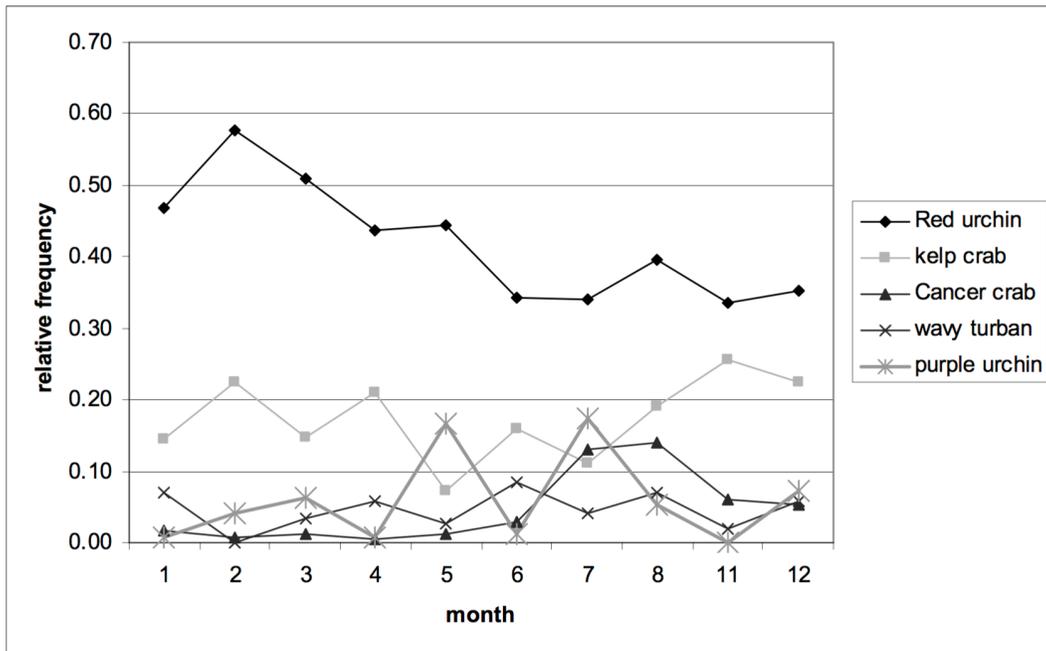
$$\text{Relative frequency} = \text{Subgroup count} / \text{Total count}$$

The above equation expresses relative frequency as a proportion. It is also often expressed as a percentage. Thus, a relative frequency of 0.50 is equivalent to a percentage of 50% or an event that occurs 50% of the time.

In this graph, the red urchin shows a relative frequency of almost 0.50 in March. This means that about 50% of the time the sea otters consumed any type of food, they ate red urchins.

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**Directions:** Using the data about sea otter diet on San Nicolas Island provided below, answer the following questions to demonstrate that you are a scientist who can interpret graphs and draw conclusions. For the purpose of this activity, focus on **three** of the five data sets: red urchins, purple urchins, and kelp crabs. (The other data represents other species of organisms, the cancer crab and the wavy turban snail, which make up a smaller portion of a San Nicolas Island sea otter’s diet.)



**Figure 7** Relative proportions of five common prey types in the diets of sea otters at San Nicolas Island by month. Numbers on x-axis refer to months (January-December 2003). Data presented are limited to months in which >100 dives were recorded.

- Trace the three data sets with colors to make them easier to see. Use red for red urchins, purple for purple urchins, and brown for kelp crabs.
- What is the x-axis labeled as on this graph? \_\_\_\_\_
- What is the y-axis labeled as on this graph? \_\_\_\_\_
- Given your answer to question 2, what does the number “5” represent? \_\_\_\_\_
- What would you title this graph? \_\_\_\_\_
- According to this data, which animal species do sea otters on San Nicolas Island eat most often? \_\_\_\_\_

7. According to this data, which of the three labeled animal species do sea otters eat least often? \_\_\_\_\_
8. Does the type of food represented in the sea otter diet change depending on the month (Yes or No)? How can you tell? \_\_\_\_\_  
\_\_\_\_\_
9. Why might a sea otter change the food it eats during different times of the year?  
\_\_\_\_\_  
\_\_\_\_\_
10. If you were going to suggest to Karana a diet plan for feeding her otter for one year, what would you suggest? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
11. Looking ahead: When you read chapter 24, pay attention to what Karana's sea otter eats when back in the ocean. Karana learns there is a food the sea otter prefers to fish! Is it represented in the graph above? \_\_\_\_\_  
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\_\_\_\_\_